290 Elwood Davis Road, Suite 340
Liverpool, New York 13088
Phone 315.453.9009
Fax 315.453.9010
www.anchorqea.com

MEMORANDUM

To:	Earl Hayter, USACE	**Date:**	September 14, 2011
From:	Kevin Russell, Anchor QEA	**Project:**	010142-01.33
	Ricardo Petroni, Anchor QEA		
	Mike Werth, Anchor QEA		
Cc:	Chip Humphrey, EPA		
	Kristine Koch, EPA		
	Carl Stivers, Anchor QEA		
Re:	Portland Harbor Hydrodynamic/Sediment Transport Model Transfer		

As requested by EPA, Anchor QEA, on behalf of the Lower Willamette Group (LWG), is providing input files and source code associated with the hydrodynamic and sediment transport models developed for the Portland Harbor site. The purpose of this memorandum is to briefly summarize the model files that are included in this transmittal, as well as to provide some general instructions on how to execute a long-term hydrodynamic and sediment transport model simulation. Recognizing EPA only requested the model code and input files, we considered it useful to also include a complete set of files that is needed to execute a long-term simulation; this includes things such as DOS batch files which map out how the simulations are executed.

FILE SUMMARY

The ZIP file provided with this transmittal contains all hydrodynamic and sediment transport model input files; specifically, it includes inputs for the preliminary 45-year monitored natural recovery (MNR) long-term projection simulation that is being run as part of the Portland Harbor Feasibility Study. The following is a brief summary of the contents of each folder and corresponding sub-folders in the ZIP file:

- *Model Grid:* This directory contains GIS files of the model grid (ESRI shapefile format). This GIS file is not an input that is read by the model code; rather, it has been provided to assist in visualizing the model grid and understanding the structure of the spatially variable input files that are read by the model. The attribute table contains the model coordinates (I,J address) so that the model

outputs can be related to locations within the Study Area (note that there are two sets of I,J values in this file; "I" and "J" are the GIS indices, while "MODI" and "MODJ" are the EFDC model indices. MODI = I+1, and MODJ = J+1). The attribute table also contains the bed map used for the sediment transport model (0 = cohesive bed, 1 = non-cohesive bed, and -1 = hard bottom).

- *HST*

  – *executable_files:* contains compiled model code for hydrodynamic and sediment transport model simulations. We understand that EPA plans to compile the model code that has been provided in this transmittal, and as such these executable files are not necessary; however they have been included for completeness. These executables have been optimized for speed (for 32-bit Windows) and provide no debug output.

      - *LWG_opt_intel_090406.exe*: hydrodynamics executable file

      - *LWG_opt_intel_32bit_100326.exe*: sediment transport executable file

  – *input_files*: contains all hydrodynamic and sediment transport model input files; these inputs are described in detail in the hydrodynamic and sediment transport (HST) model user manual provided as part of this transmittal.

  – *simulation_templates*: folder containing necessary directory structure and DOS batch file templates needed to execute the hydrodynamic and sediment transport model 45-year projection simulation. Directions on how to execute these simulations are provided below.

LONG-TERM HYDRODYNAMIC MODEL RUN PROCEDURE

The hydrodynamic (and sediment transport) model input files in the transmitted ZIP file (described above) have been organized in a way that allows the user to easily execute the long-term simulation included, if desired. To execute the simulation, first extract all files contained in the *HST* folder in the attached ZIP file to a local hard drive. Execution of the hydrodynamic model projection simulation is controlled by a single DOS batch file called *run_hydro.bat* located in the "*simulation_templates\hydro\Longterm\LWG_Hydro_1006-01*" directory.

As noted above, execution of the hydrodynamic model simulations (and likewise the sediment transport model simulation described below) is controlled by a single DOS batch file; however, the long-term simulation is actually conducted through a series of monthly

sub-simulations that are controlled by a series of DOS batch files. (The use of these smaller monthly sub-simulations is beneficial while debugging model simulations and for minimizing the amount of lost time in the event of a model run error.) The main batch file used to execute the full simulation ("*run_hydro.bat*" described above) first calls a batch file that loops through the sub-simulations by year; this yearly sub-simulation batch file then loops by, and calls a separate batch file for each monthly sub-simulation.

Note that the long-term hydrodynamic simulation template only includes 30 years (not 45). This 30-year simulation was based on flow data from the USGS Portland gauge from 1979-2008. The flows over this time period were judged to provide a good representation of the full range of flows experienced in the Portland Harbor Study Area, and include an approximate 100-year return frequency flow event that occurred during January 1996. The flows (and hydrodynamic model outputs) for the last 15 years of the 45-year simulation are a repeat of the first 15 years of the aforementioned time series (i.e., flow data from the USGS Portland gauge from 1979-1993). As such, the sediment transport model DOS batch files for the last 15 years of the simulation (described below) call hydrodynamic model "coupling" output from the first 15 years of the simulation[1].

LONG-TERM SEDIMENT TRANSPORT MODEL RUN PROCEDURE

Similar to the hydrodynamic model described above, to execute a sediment transport model simulation, first copy all files contained in the *HST* folder from the external hard drive to a local hard drive (if not already done for hydrodynamics). Execution of the sediment transport model 45-year projection simulation is controlled by a single DOS batch file called *run_LWG_sedtran.bat* located in the "*simulation_templates\Sedtran\Longterm\LWG_Sedtran_longterm_1008-02*" directory. Similar to hydrodynamics, while the sediment transport model is controlled by a single DOS batch file (*run_LWG_sedtran.bat*), the full 45-year simulation is conducted through a series

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[1] As described in the HST user manual, hydrodynamics and sediment transport can be simulated either independently or concurrently. For the Portland Harbor model, hydrodynamic and sediment transport simulations have been executed sequentially to reduce computational time in the sediment transport simulations (i.e., to save time during sediment transport simulations, the hydrodynamic model results are read from the coupling file rather than having the model perform the calculations at the same time as those for sediment transport). Given the large size of the output files, and because EPA has indicated that it intends to run the hydrodynamic model, hydrodynamic model output "coupling files" that are used in the sediment transport simulations have not been provided.

of monthly sub-simulations that are controlled by a series of DOS batch files (see discussion above under hydrodynamics).